National Transportation Safety Board
Aviation Accident Final Report

Location:	Lexington, KY	**Accident Number:**	DCA06MA064
Date & Time:	08/27/2006, 0607 EDT	**Registration:**	N431CA
Aircraft:	Bombardier, Inc. CRJ-100	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	49 Fatal, 1 Serious
Flight Conducted Under:	Part 121: Air Carrier - Scheduled		

Analysis

The Safety Board's full report is available at http://www.ntsb.gov/publictn/A_Acc1.htm. The Aircraft Accident Report number is NTSB/AAR-07/05.

On August 27, 2006, about 0606:35 eastern daylight time, Comair flight 5191, a Bombardier CL-600-2B19, N431CA, crashed during takeoff from Blue Grass Airport, Lexington, Kentucky. The flight crew was instructed to take off from runway 22 but instead lined up the airplane on runway 26 and began the takeoff roll. The airplane ran off the end of the runway and impacted the airport perimeter fence, trees, and terrain. The captain, flight attendant, and 47 passengers were killed, and the first officer received serious injuries. The airplane was destroyed by impact forces and postcrash fire. The flight was operating under the provisions of 14 Code of Federal Regulations Part 121 and was en route to Hartsfield-Jackson Atlanta International Airport, Atlanta, Georgia. Night visual meteorological conditions prevailed at the time of the accident.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the flight crewmembers's failure to use available cues and aids to identify the airplane's location on the airport surface during taxi and their failure to cross-check and verify that the airplane was on the correct runway before takeoff. Contributing to the accident were the flight crew's nonpertinent conversation during taxi, which resulted in a loss of positional awareness, and the Federal Aviation Administration's failure to require that all runway crossings be authorized only by specific air traffic control clearances.

Findings

Occurrence #1: MISCELLANEOUS/OTHER
Phase of Operation: TAXI

Findings
1. LIGHT CONDITION - DARK NIGHT
2. (F) PROCEDURES/DIRECTIVES - NOT FOLLOWED - FLIGHTCREW
3. (C) BECAME LOST/DISORIENTED - INATTENTIVE - FLIGHTCREW
4. (C) WRONG TAXI ROUTE - NOT DETECTED - FLIGHTCREW
5. (F) INSTRUCTIONS,WRITTEN/VERBAL - NOT REQUIRED - FAA(OTHER/ORGANIZATION)
6. (F) PROCEDURE INADEQUATE - FAA(OTHER/ORGANIZATION)

Occurrence #2: OVERRUN
Phase of Operation: TAKEOFF

Findings
7. (C) WRONG RUNWAY - INATTENTIVE - FLIGHTCREW
8. (C) WRONG RUNWAY - NOT DETECTED - FLIGHTCREW

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: TAKEOFF

Factual Information

The Safety Board's full report is available at http://www.ntsb.gov/publictn/A_Acc1.htm. The Aircraft Accident Report number is NTSB/AAR-07/05.

On August 27, 2006, about 0606:35 eastern daylight time, Comair flight 5191, a Bombardier CL-600-2B19, N431CA, crashed during takeoff from Blue Grass Airport, Lexington, Kentucky. The flight crew was instructed to take off from runway 22 but instead lined up the airplane on runway 26 and began the takeoff roll. The airplane ran off the end of the runway and impacted the airport perimeter fence, trees, and terrain. The captain, flight attendant, and 47 passengers were killed, and the first officer received serious injuries. The airplane was destroyed by impact forces and postcrash fire. The flight was operating under the provisions of 14 Code of Federal Regulations Part 121 and was en route to Hartsfield-Jackson Atlanta International Airport, Atlanta, Georgia. Night visual meteorological conditions prevailed at the time of the accident.

According to a customer service agent working in the Comair operations area, the flight crew checked in for the flight at 0515. The agent indicated that the crewmembers were casually conversing and were not yawning or rubbing their eyes.

The flight crew collected the flight release paperwork, which included weather information, safety-of-flight notices to airmen (NOTAM), the tail number of the airplane to be used for the flight, and the flight plan. The flight crew then proceeded to an area on the air carrier ramp where two Comair Canadair regional jet (CRJ) airplanes were parked. A Comair ramp agent, who was performing the security check of the accident airplane, noticed that the accident flight crew had boarded the wrong airplane and started its auxiliary power unit (APU). Another company ramp agent notified the flight crewmembers that they had boarded the wrong airplane. The flight crew then shut down the APU and proceeded to the correct airplane.

The LEX air traffic control tower (ATCT) was staffed with one controller at the time of the accident airplane's preflight activities, taxi, and attempted takeoff. The controller was responsible for all tower and radar positions.

The cockpit voice recorder (CVR) recording began about 0536:08. At that time, the flight crew was conducting standard preflight preparations. About 0548:24, the CVR recorded automatic terminal information service (ATIS) information "alpha," which indicated that runway 22 was in use. About 1 minute afterward, the first officer told the controller that he had received the ATIS information.

About 0549:49, the controller stated, "cleared to Atlanta Airport via Bowling Green, ERLIN TWO arrival. Maintain six thousand [feet mean sea level (msl)] .... Departure's [departure control radio frequency] one two zero point seven five. Squawk [transponder code] six six four one." The first officer replied, "okay, got uh, Bowling Green uh, missed the other part. Six thousand, twenty point seven five. Six six four one." The controller then repeated, "it's ERLIN TWO. Echo Romeo Lima India November Two arrival," and the first officer acknowledged the arrival information.

About 0552:04, the captain began a discussion with the first officer about which of them should be the flying pilot to ATL. The captain offered the flight to the first officer, and the first officer accepted. About 0556:14, the captain stated, "Comair standard," which is part of the taxi briefing, and "run the checklist at your leisure."

About 0556:34, the first officer began the takeoff briefing, which is part of the before starting engines checklist. During the briefing, he stated, "he said what runway ... two four," to which the captain replied, "it's two two." The first officer continued the takeoff briefing, which included three additional references to runway 22. After briefing that the runway end identifier lights were out, the first officer commented, "came in the other night it was like ... lights are out all over the place." The first officer also stated, "let's take it out and ... take ... [taxiway] Alpha. Two two's a short taxi." The captain called the takeoff briefing complete about 0557:40.

Starting about 0558:15, the first officer called for the first two items on the before starting engines checklist. When the captain pointed out that the before starting engines checklist had already been completed, the first officer questioned, "we did"? Afterward, the first officer briefed the takeoff decision speed (V1) as 137 knots and the rotation speed (VR) as 142 knots.

Flight data recorder (FDR) data for the accident flight started about 0558:50. The FDR showed that, at some point before the start of the accident flight recording, the pilots' heading bugs had been set to 227°, which corresponded to the magnetic heading for runway 22.

About 0559:14, the captain stated that the airplane was ready to push back from the gate. FDR data showed that, about 0600:08 and 0600:55, the left and right engines, respectively, were started.

About 0602:01, the first officer notified the controller that the airplane was ready to taxi. The controller then instructed the flight crew to taxi the airplane to runway 22. This instruction authorized the airplane to cross runway 26 (the intersecting runway) without stopping. The first officer responded, "taxi two two." FDR data showed that the captain began to taxi the airplane about 0602:17. About the same time, SkyWest flight 6819 departed from runway 22.

About 0602:19, the captain called for the taxi checklist. Beginning about 0603:02, the first officer made two consecutive statements, "radar terrain displays" and "taxi check's complete," that were spoken in a yawning voice. About 0603:38, American Eagle flight 882 departed from runway 22.

From about 0603:16 to about 0603:56, the flight crew engaged in conversation that was not pertinent to the operation of the flight. About 0604:01, the first officer began the before takeoff checklist and indicated again that the flight would be departing from runway 22.

FDR data showed that, about 0604:33, the captain stopped the airplane at the holding position, commonly referred to as the hold short line, for runway 26. Afterward, the first officer made an announcement over the public address system to welcome the passengers and completed the before takeoff checklist. About 0605:15, while the airplane was still at the hold short line for runway 26, the first officer told the controller that "Comair one twenty one" was ready to depart at his leisure; about 3 seconds later, the controller responded, "Comair one ninety one ... fly runway heading. Cleared for takeoff." Neither the first officer nor the controller stated the runway number during the request and clearance for takeoff. FDR data showed that, about 0605:24, the captain began to taxi the airplane across the runway 26 hold short line. The CVR recording showed that the captain called for the lineup checklist at the same time.

About 0605:40, the controller transferred responsibility for American Eagle flight 882 to the Indianapolis Air Route Traffic Control Center (ARTCC). FDR data showed that, about 1 second later, Comair flight 5191 began turning onto runway 26. About 0605:46, the first officer called the lineup checklist complete.

About 0605:58, the captain told the first officer, "all yours," and the first officer acknowledged, "my brakes, my controls." FDR data showed that the magnetic heading of the airplane at that time was about 266°, which corresponded to the magnetic heading for runway 26. About 0606:05, the CVR recorded a sound similar to an increase in engine rpm. Afterward, the first officer stated, "set thrust please," to which the captain responded, "thrust set." About 0606:16, the first officer stated, "[that] is weird with no lights," and the captain responded, "yeah," 2 seconds later.

About 0606:24, the captain called "one hundred knots," to which the first officer replied, "checks." At 0606:31.2, the captain called, "V one, rotate," and stated, "whoa," at 0606:31.8. FDR data showed that the callout for V1 occurred 6 knots early and that the callout for VR occurred 11 knots early; both callouts took place when the airplane was at an airspeed of 131 knots. FDR data also showed that the control columns reached their full aft position about 0606:32 and that the airplane rotated at a rate of about 10° per second.

The airplane impacted an earthen berm located about 265 feet from the end of runway 26, and the CVR recorded the sound of impact at 0606:33.0. FDR airspeed and altitude data showed that the airplane became temporarily airborne after impacting the berm but climbed less than 20 feet off the ground.

The CVR recorded an unintelligible exclamation by a flight crewmember at 0606:33.3. FDR data showed that the airplane reached its maximum airspeed of 137 knots about 0606:35. The aircraft performance study for this accident showed that, at that time, the airplane impacted a tree located about 900 feet from the end of runway 26. The CVR recorded an unintelligible exclamation by the captain at 0606:35.7, and the recording ended at 0606:36.2.

In a postaccident interview, the controller stated that he did not see the airplane take off. The controller also stated that, after hearing a sound, he saw a fire west of the airport and activated the crash phone (the direct communication to the airport's operations center and fire station) in response. The air traffic control (ATC) transcript showed that the crash phone was activated about 0607:17 and that the airport operations center dispatcher responded to the crash phone about 0607:22. According to the ATC transcript, the controller announced an "alert three" and indicated that a Comair jet taking off from runway 22 was located at the west side of the airport just off the approach end of runway 8 (which is also the departure end of runway 26). Section 1.15.1 discusses the emergency response.

FINDINGS

1) The captain and the first officer were properly certificated and qualified under Federal regulations. There was no evidence of any medical or behavioral conditions that might have adversely affected their performance during the accident flight. Before reporting for the accident flight, the flight crewmembers had rest periods that were longer than those required by Federal regulations and company policy.

2) The accident airplane was properly certified, equipped, and maintained in accordance with Federal regulations. The recovered components showed no evidence of any structural, engine, or system failures.

3) Weather was not a factor in this accident. No restrictions to visibility occurred during the airplane's taxi to the runway and the attempted takeoff. The taxi and the attempted takeoff occurred about 1 hour before sunrise during night visual meteorological conditions and with no illumination from the moon.

4) The captain and the first officer believed that the airplane was on runway 22 when they taxied onto runway 26 and initiated the takeoff roll.

5) The flight crew recognized that something was wrong with the takeoff beyond the point from which the airplane could be stopped on the remaining available runway.

6) Because the accident airplane had taxied onto and taken off from runway 26 without a clearance to do so, this accident was a runway incursion.

7) Adequate cues existed on the airport surface and available resources were present in the cockpit to allow the flight crew to successfully navigate from the air carrier ramp to the runway 22 threshold.

8) The flight crewmembers' nonpertinent conversation during the taxi, which was not in compliance with Federal regulations and company policy, likely contributed to their loss of positional awareness.

9) The flight crewmembers failed to recognize that they were initiating a takeoff on the wrong runway because they did not cross-check and confirm the airplane's position on the runway before takeoff and they were likely influenced by confirmation bias.

10) Even though the flight crewmembers made some errors during their preflight activities and the taxi to the runway, there was insufficient evidence to determine whether fatigue affected their performance.

11) The flight crew's noncompliance with standard operating procedures, including the captain's abbreviated taxi briefing and both pilots' nonpertinent conversation, most likely created an atmosphere in the cockpit that enabled the crew's errors.

12) The controller did not notice that the flight crew had stopped the airplane short of the wrong runway because he did not anticipate any problems with the airplane's taxi to the correct runway and thus was paying more attention to his radar responsibilities than his tower responsibilities.

13) The controller did not detect the flight crew's attempt to take off on the wrong runway because, instead of monitoring the airplane's departure, he performed a lower-priority administrative task that could have waited until he transferred responsibility for the airplane to the next air traffic control facility.

14) The controller was most likely fatigued at the time of the accident, but the extent that fatigue affected his decision not to monitor the airplane's departure could not be determined in part because his routine practices did not consistently include the monitoring of takeoffs.

15) The Federal Aviation Administration's operational policies and procedures at the time of the accident were deficient because they did not promote optimal controller monitoring of aircraft surface operations.

16) The first officer's survival was directly attributable to the prompt arrival of the first responders; their ability to extricate him from the cockpit wreckage; and his rapid transport to the hospital, where he received immediate treatment.

17) The emergency response for this accident was timely and well coordinated.

18) A standard procedure requiring 14 Code of Federal Regulations Part 91K, 121, and 135 pilots to confirm and cross-check that their airplane is positioned at the correct runway before

crossing the hold short line and initiating a takeoff would help to improve the pilots' positional awareness during surface operations.

19) The implementation of cockpit moving map displays or cockpit runway alerting systems on air carrier aircraft would enhance flight safety by providing pilots with improved positional awareness during surface navigation.

20) Enhanced taxiway centerline markings and surface painted holding position signs provide pilots with additional awareness about the runway and taxiway environment.

21) This accident demonstrates that 14 Code of Federal Regulations 91.129(i) might result in mistakes that have catastrophic consequences because the regulation allows an airplane to cross a runway during taxi without a pilot request for a specific clearance to do so.

22) If controllers were required to delay a takeoff clearance until confirming that an airplane has crossed all intersecting runways to a departure runway, the increased monitoring of the flight crew's surface navigation would reduce the likelihood of wrong runway takeoff events.

23) If controllers were to focus on monitoring tasks instead of administrative tasks when aircraft are in the controller's area of operations, the additional monitoring would increase the probability of detecting flight crew errors.

24) Even though the air traffic manager's decision to staff midnight shifts at Blue Grass Airport with one controller was contrary to Federal Aviation Administration verbal guidance indicating that two controllers were needed, it cannot be determined if this decision contributed to the circumstances of this accident.

25) Because of an ongoing construction project at Blue Grass Airport, the taxiway identifiers represented in the airport chart available to the flight crew were inaccurate, and the information contained in a local notice to airmen about the closure of taxiway A was not made available to the crew via automatic terminal information service broadcast or the flight release paperwork.

26) The controller's failure to ensure that the flight crew was aware of the altered taxiway A configuration was likely not a factor in the crew's inability to navigate to the correct runway.

27) Because the information in the local notice to airmen (NOTAM) about the altered taxiway A configuration was not needed for the pilots' wayfinding task, the absence of the local NOTAM from the flight release paperwork was not a factor in this accident.

28) The presence of the extended taxiway centerline to taxiway A north of runway 8/26 was not a factor in this accident.

Pilot Information

Certificate:	Airline Transport; Flight Instructor; Commercial; Sport Pilot	**Age:**	35, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 With Waivers/Limitations	**Last FAA Medical Exam:**	08/01/2006
Occupational Pilot:		**Last Flight Review or Equivalent:**	07/01/2006
Flight Time:	4710 hours (Total, all aircraft), 3082 hours (Total, this make and model), 158 hours (Last 90 days, all aircraft), 55 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Co-Pilot Information

Certificate:	Airline Transport; Flight Instructor; Commercial	**Age:**	44, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane Single-engine	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 With Waivers/Limitations	**Last FAA Medical Exam:**	07/01/2006
Occupational Pilot:		**Last Flight Review or Equivalent:**	04/01/2006
Flight Time:	6564 hours (Total, all aircraft), 3564 hours (Total, this make and model), 940 hours (Pilot In Command, all aircraft), 245 hours (Last 90 days, all aircraft), 64 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Bombardier, Inc.	**Registration:**	N431CA
Model/Series:	CRJ-100	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Transport	**Serial Number:**	7472
Landing Gear Type:	Retractable - Tricycle	**Seats:**	54
Date/Type of Last Inspection:	08/01/2006, Continuous Airworthiness	**Certified Max Gross Wt.:**	53000 lbs
Time Since Last Inspection:	0 Hours	**Engines:**	2 Turbo Fan
Airframe Total Time:	14536 Hours at time of accident	**Engine Manufacturer:**	General Electric
ELT:	Not installed	**Engine Model/Series:**	CF-34-3A1
Registered Owner:	First Union National Bank Trustee	**Rated Power:**	8729 lbs
Operator:	COMAIR INC	**Operating Certificate(s) Held:**	Flag carrier (121)
Operator Does Business As:		**Operator Designator Code:**	COMR

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Night/Dark
Observation Facility, Elevation:	LEX	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	0605 EDT	**Direction from Accident Site:**	260°
Lowest Cloud Condition:	Few / 9000 ft agl	**Visibility**	8 Miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	200°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	24°C / 19°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Lexington, KY (LEX)	**Type of Flight Plan Filed:**	IFR
Destination:	Atlanta, GA (ATL)	**Type of Clearance:**	IFR
Departure Time:	EDT	**Type of Airspace:**	

Airport Information

Airport:	BLUE GRASS (LEX)	**Runway Surface Type:**	Asphalt; Concrete
Airport Elevation:	979 ft	**Runway Surface Condition:**	Dry
Runway Used:	26	**IFR Approach:**	None
Runway Length/Width:	3500 ft / 75 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	2 Fatal, 1 Serious	**Aircraft Damage:**	Destroyed
Passenger Injuries:	47 Fatal	**Aircraft Fire:**	On-Ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	49 Fatal, 1 Serious	**Latitude, Longitude:**	

Administrative Information

Investigator In Charge (IIC):	Joseph M Sedor	**Adopted Date:**	09/27/2007
Additional Participating Persons:	David Keenan; Federal Aviation Administration; Washington, DC Scott Granger; Air Line Pilot Association; Powell Butte, OR John Coon; Blue Grass Airport; Lexington, KY Paul Vislosky; Comair Inc.; Erlanger, KY Les McVey; GE Transportation Aircraft Engines; Cincinnati, OH David Supplee; Intl. Assoc. of Machinists and Aerospace Workers; Seminole, FL Bill Shea; National Air Traffic Controllers Association; Hurst, TX Lynn Dziad; Teamsters Local 513 Airline Division; Florence, KY Jean-Marc Ledoux; Transportaton Safety Board of Canada; Dorval, Canada,		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.		